# Leica GPS1200
# **User Manual**

**Version 4.0**
**English**

- when it has to be **right**

Leica Geosystems

# Introduction

**Purchase**

Congratulations on the purchase of a GPS1200 series instrument.

This manual contains important safety directions as well as instructions for setting up the product and operating it. Refer to "7 Safety Directions" for further information. Read carefully through the User Manual before you switch on the product.

**Product identification**

The type and the serial number of your product are indicated on the type plate. Enter the type and serial number in your manual and always refer to this information when you need to contact your agency or Leica Geosystems authorized service workshop.

Type: _____

Serial No.: _____

**Symbols**

The symbols used in this manual have the following meanings:

| Type | Description |
|---|---|
| ⚠ **Danger** | Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. |
| ⚠ **Warning** | Indicates a potentially hazardous situation or an unintended use which, if not avoided, could result in death or serious injury. |
| ⚠ **Caution** | Indicates a potentially hazardous situation or an unintended use which, if not avoided, may result in minor or moderate injury and/or appreciable material, financial and environmental damage. |
| ☞ | Important paragraphs which must be adhered to in practice as they enable the product to be used in a technically correct and efficient manner. |

**Trademarks**

- Windows and Windows CE are a registered trademark of Microsoft Corporation
- CompactFlash and CF are trademarks of SanDisk Corporation
- Bluetooth is a registered trademark of Bluetooth SIG, Inc

All other trademarks are the property of their respective owners.

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# 1 How to Use this Manual

| | |
|---|---|
| ☞ | It is recommended to set-up the product while reading through this manual. |
| **Path** | **Main Menu: Manage...\Data** stands for this working sequence:<br>From the **Main Menu** select **Manage...** and then select **Data**. |
| **Screen** | **CONFIGURE General Menu** describes the name of the screen. |
| **Page** | Screens can have more than one page. **Units** page describes a specific page of a screen. For example: '...in **CONFIGURE Units & Formats**, **Units** page...'. |
| **Fields and options** | Fields displayed on the screen are described as **<Coord System:>** or **<Coord System: Swiss>**, if 'Swiss' is the selected coordinate system. |
| **Index** | The index is at the back of the manual. |
| ☞ | Keys, fields and options on the screens which are considered as self-explanatory are not explained. |
| **Validity of this manual** | • This manual applies to all GPS1200 instruments. Differences between the various models are marked and described. |

- The RX1200 is available as RX1210 or with touch screen functionality as RX1210T, RX1220T or RX1250 X. The names RX1210 and RX1220 are used throughout the manual and may also represent the touch screen models. Only use the supplied stylus on the screens of the touch screen models.

**Illustrations**

For the purpose of the illustrations, a GX1230 model has been selected which is representative for all models.

**Available documentation**

**General description**

| Name of documentation | Description |
|---|---|
| User Manual | All instructions required in order to operate the product to a basic level are contained in the User Manual. Provides an overview of the product together with technical data and safety directions. |

| Name of documentation | Description |
|---|---|
| System Field Manual | Describes the general working of the product in standard use. Intended as a quick reference field guide. |
| Applications Field Manual | Describes specific onboard application programs in standard use. Intended as a quick reference field guide. The RoadRunner application program is described in a separate manual. |
| Technical Reference Manual | Overall comprehensive guide to the product and program functions. Included are detailed descriptions of special software/hardware settings and software/hardware functions intended for technical specialists. |

**Available documentation depending on use case**

| Use case | User Manual<br><br>for | System Field Manual<br><br>for | Applications Field Manual<br><br>for | Technical Reference Manual<br><br>for |
|---|---|---|---|---|
| TPS | TPS1200 | TPS1200 | TPS1200 | TPS1200 |
| TPS RCS | RX1200 | TPS1200 | TPS1200 | TPS1200 |
| GPS | GPS1200 | GPS1200 | GPS1200 | GPS1200 |
| GPS SmartRover | RX1200 | GPS1200 | GPS1200 | GPS1200 |

**Format of the documentation**

The GPS1200 CD contains the entire documentation in electronic format. All manuals are also available in printed form except for the GPS1200 Technical Reference Manual.

# 2 Description of the System

## 2.1 System Components

**Main components**

| Component | Description |
|---|---|
| Receiver | To calculate a range to all visible satellites. |
| RX1200 | To operate the user interface either by the keyboard or by the touch screen with supplied stylus. |
| Antenna | To receive the satellite signals from the GNSS (Global Navigation Satellite System) satellites. |
| LEICA Geo Office | The office software including a series of help programs which support working with GPS1200. |
| LEICA GPS Spider | The reference station software required to operate the reference station receivers of GPS1200. |

**Receivers**

| Receiver | Description |
|---|---|
| GX1230 GG | 14 L1, 14 L2 channels (GPS), twelve L1, twelve L2 channels (GLONASS), two channels SBAS, code and phase, real-time capable |
| GX1230 | Twelve L1, twelve L2 channels, code and phase, real-time capable |
| GX1220 | Twelve L1, twelve L2 channels, code and phase |
| GX1210 | Twelve L1 channels, code and phase |
| GX1200 with PPS/Event option | Twelve L1, twelve L2 channels, code and phase, real-time capable, with event and PPS ports |
| GRX1200 Classic | Twelve L1, twelve L2 channels, code and phase, real-time capable, for reference station applications |
| GRX1200 Lite | Twelve L1, twelve L2 channels, code and phase, real-time capable, for reference station applications, no ring buffer logging, no download of internally logged data and upload of files to receiver by remote control |
| GRX1200 Pro | Twelve L1, twelve L2 channels, code and phase, real-time capable, with event, PPS, oscillator and NET port, for reference station applications |

| Receiver | Description |
|---|---|
| GRX1200 GG Pro | 14 L1, 14 L2 channels (GPS), twelve L1, twelve L2 channels (GLONASS), code and phase, real-time capable, with event, PPS, oscillator and NET port, for reference station applications |

The GX1230 GG, GX1230, GX1220, GX1200 with PPS/Event option and GRX1200 Series receivers use the GPS P-code signal, which by U.S. policy is liable to be switched off without notice. Phase measurements on L2 are ensured as these receivers automatically switch to patented tracking techniques.

**Antennas used with receivers**

| Receiver | Antenna |
|---|---|
| GX1230 GG/GX1230/GX1220 | Typically: AX1202/AX1202 GG, otherwise: AT504 |
| GX1210 | AX1201 |
| GRX1200 Series | Typically: AT504, otherwise: AX1202/AX1202 GG |

**LEICA Geo Office**

- LGO supports the GPS1200 and TPS1200 instruments. It also supports all other Leica TPS instruments.
- LGO is based on a graphical user interface with standard Windows® operating procedures.
- LGO provides the following functionality:

| Functionality | Description |
|---|---|
| Standard Functionality | Includes data exchange between computer and receiver, data management including viewing and editing, reporting, creation and management of codelists, creation and use of format files for data conversion, uploading and deleting of system software and application programs. |
| Extended Functionality | Includes coordinate transformations, GPS and GLONASS post processing, level data processing, network adjustment, GIS and CAD Export. |

- Supported operating systems: Windows® XP, Windows® 2000.

Refer to the online help of LGO for additional information.

## LEICA GPS Spider

The reference station software is known as LEICA GPS Spider. It is required to operate the GRX1200 Series receivers.

**Use**

- to connect from a PC to a GPS1200 receiver locally or remotely.
- to configure receiver operation.
- to monitor receiver operation.
- to automatically download raw data.
- to automatically convert data to RINEX format.
- to automatically archive data files.
- to automatically distribute to FTP locations.

**Operating systems**

- Windows® XP
- Windows® 2000

Refer to the online help of LEICA GPS Spider for additional information.

## 2.2 System Concept

### 2.2.1 Software Concept

**Description**

All receivers use the same software concept.

**Software type**

| Software type | Description |
|---|---|
| System software | This important software covers the basic functions of the instrument. System software is also referred to as firmware.<br>The programs Survey and Setup are integrated into the firmware and cannot be deleted.<br>The English language is integrated into the firmware and cannot be deleted. |
| Language software | Numerous languages are available for the receivers. Language software is also referred to as system language.<br>The system software enables a maximum of three languages which can be stored at any one time - the English language and two other languages. The English language is the default language and cannot be deleted. One language is chosen as the active language. |

| Software type | Description |
|---|---|
| Application programs | A suite of optional survey-specific application programs are available for the instrument.<br>Some of these programs are freely available and can be loaded and are immediately activated. The other programs must be purchased and are only activated with a licence key. |
| Customised application programs | Custom software specific to user requirements can be developed using the GeoC++ development kit.<br>Information on the GeoC++ development environment is available on request from a Leica Geosystems representative. |
| RX1200 software | For RX1210 and RX1220T. This software covers display, sound and communication settings of the RX1210 and RX1220T. |

**Software upload**

All instrument software is stored in the System RAM of the receiver. The software can be uploaded onto the receiver using the following methods:

- Using LGO the software is transferred via the serial interface to the CompactFlash card in the receiver, which is then stored to the System RAM.
- By connecting the CompactFlash card directly to the computer either via an internal card slot housing or an external OMNI drive, the software is transferred to the card, which is then stored to the System RAM.

## 2.2.2 Data Storage and Data Conversion Concept

**Description**

Data is stored within a job in a database on a memory device. This is either a CompactFlash card or an internal memory.

**Memory device**

CompactFlash card: A CompactFlash card slot is standard. A CompactFlash card can be inserted and removed. Various capacities are available.

Whilst other CompactFlash cards may be used, Leica recommends to only use Leica CompactFlash cards and is not responsible for data loss or any other error that may occur whilst using a non-Leica card.

Internal memory: An internal memory is optional. It resides inside the receiver. Available capacity: 256 MB

Unplugging connecting cables or removing the CompactFlash card during the measurement may cause loss of data. Always return to **GPS1200 Main Menu** before removing the CompactFlash card and switch off the instrument before removing cables.

For GRX1200 Series receivers:
While in remote operation mode, stop point occupation and ring buffer logging before removing the CompactFlash card.

**Data conversion**

**Export**

Data can be exported from a job in a wide range of ASCII formats. The export format is defined in Format Manager which is a PC tool in LEICA Geo Office. Refer to the online help of LGO for information on creating format files.

**Import**

Data can be imported from ASCII, GSI8 or GSI16 format.

**Transfer raw data to LGO**

Raw data can be transferred between the database on the CompactFlash card or the internal memory of the receiver and LGO in two ways:

- From the CompactFlash card or the internal memory directly through a serial interface to a project in LGO on a PC.
- From the CompactFlash card using for example an OMNI drive as supplied by Leica Geosystems to a project in LGO on a PC.

CompactFlash cards can directly be used in an OMNI drive as supplied by Leica Geosystems. Other PC card drives may require an adaptor.

## 2.2.3 Power Concept

**General**

Use the Leica Geosystems batteries, chargers and accessories or accessories recommended by Leica Geosystems to ensure the correct functionality of the instrument.

**Power options**

**Receiver**

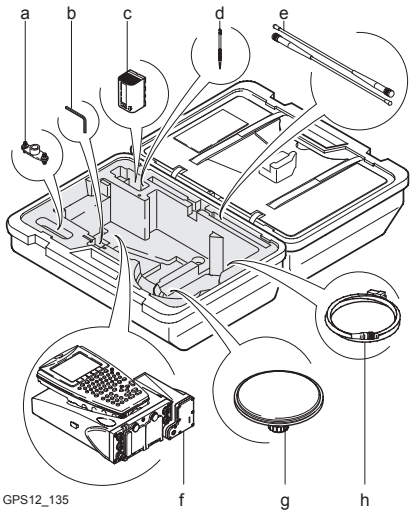
Power for the receiver can be supplied either internally or externally. Up to two external power supplies can be connected using a Y-cable. For the GRX1200 Series one of the two external power supplies can be configured to be the primary which is always used when available.

| | |
|---|---|
| Internal power supply: | Two GEB221 batteries fit into the receiver. |
| External power supply: | GEB171 battery connected via a cable.<br>OR<br>Car battery connected via a converter cable supplied by Leica Geosystems.<br>OR<br>10.5-28 V DC power supply via a converter cable supplied by Leica Geosystems.<br>OR<br>110/240 V AC to 12 V DC power supply unit, supplied by Leica Geosystems. |

For permanent operations use **U**ninterruptible **P**ower **S**upply units as a back-up in case of a main power failure.

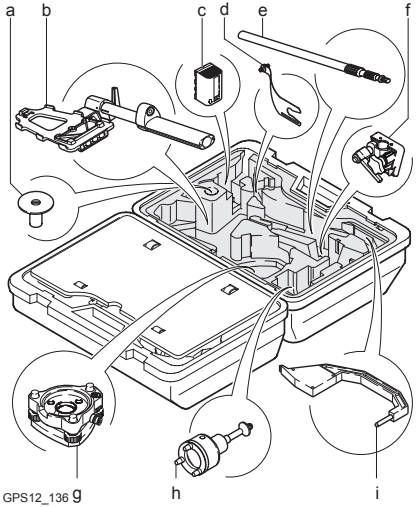
## 2.3 Container Contents

**Container for GX1200 receivers and delivered accessories part 1 of 2**




a) Double arm for antennas of devices
b) Adjusting pin
c) Spare battery
d) Supplied stylus
e) Antennas of device
f) GX1200 with RX1210 and device such as radio
g) Antenna
h) Cables

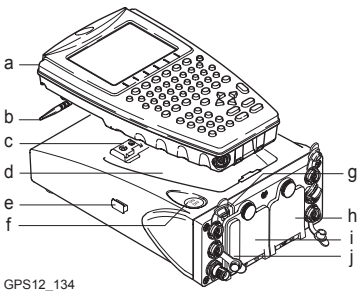
**Container for GX1200 receivers and delivered accessories part 2 of 2**




a) Base for telescopic rod
b) Holder for RX1210 on pole with grip for pole
c) Spare battery
d) Arm 15 cm long for antenna of device
e) Telescopic rod
f) Holder for GX1200 on pole
g) Tribrach
h) Carrier
i) Height hook

## 2.4 Receiver Components

**Receiver components**




a) RX1200
b) Supplied stylus
c) Clip-on-contacts for connecting RX1200 without cable
d) Recess for RX1200
e) Guide rail for clip-on-housing of a device
f) ON/OFF button
g) LED indicators
h) Battery compartment 2 or port NET
i) Battery compartment 1
j) CompactFlash card compartment

**ON/OFF button**

The receiver can be preprogrammed in the office and used in the field without the RX1200 attached. In this case, the receiver is turned on by holding down the ON/OFF button for 2 s or off by holding down the ON/OFF button for 4 s. A green steady light at the power LED indicates that the receiver is turned on.

# 3 User Interface

## 3.1 Operating Principles

**Keyboard and touch screen**

The user interface is operated either by the keyboard or by the touch screen with supplied stylus. The workflow is the same for keyboard and touch screen. The difference is the way information is selected and entered.

**Turn instrument on**

Press **PROG**.

**Turn instrument off**

The instrument can only be turned off in the **GPS1200 Main Menu** screen.

Press both **USER** and **PROG** simultaneously.

OR

Hold **ESC** for 2 s.

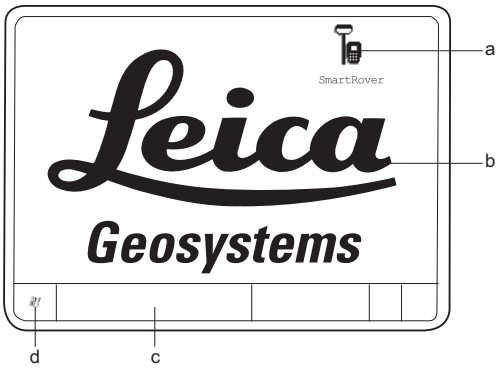
**Lock/Unlock keyboard**

| Option | Description |
|---|---|
| Lock | To lock the keyboard press and hold **SHIFT** for 3 s. The message 'Keyboard locked' is momentariliy displayed on the Message Line. |

| Option | Description |
|---|---|
| Unlock | To unlock the keyboard press and hold **SHIFT** for 3 s. The message 'Keyboard unlocked' is momentariliy displayed on the Message Line. |

**Switching between Leica software and Windows CE desktop**

This is valid for RX1250.




RX12_33

a) Icon to start Leica software
b) Windows CE desktop
c) Task bar
d) Start button

**Access Leica software**

| IF | THEN |
|---|---|
| RX1250 is started | the Leica software comes up automatically. |
| Windows CE desktop is active | double click to display the Leica software.<br>OR<br>**SHIFT PROG** ( ) to display the Leica software. |
| Leica software is minimised | double click to maximise it.<br>OR<br>select **SmartRover** in the task bar to maximise it. |

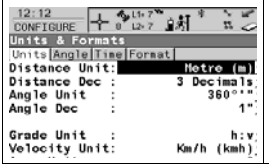
**Access Windows CE desktop**

| IF | THEN |
|---|---|
| Leica software is to be minimised | **SHIFT MINIM (F5)** in **Main Menu**. |
| Leica software is to be closed | **SHIFT EXIT (F6)** in **Main Menu**. |
| Windows CE task bar is to be displayed | **SHIFT PROG** ( ). |

## Selecting from a menu

| Appearance | Description |
|---|---|
| | To select an item from a menu, do one of the following:<br>Move the focus to the item. **ENTER** or **CONT (F1)**<br>OR<br>Type the complete selection number in front of the item. **ENTER** or **CONT (F1)** are not required.<br>OR<br>Tap on the item. |

## Selecting a page

| Appearance | Description |
|---|---|
|  | To select a page in a screen, do one of the following:<br>**PAGE (F6)**.<br>OR<br>Tap on the page tab. |

## Appearance and selection from a choicelist

Choicelists have various appearances.

### Closed choicelist

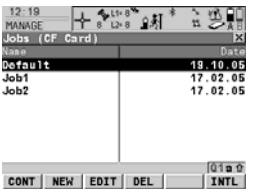
| Appearance | Description | Selection |
|---|---|---|
| | Triangles on the right indicate further available choices. | Use the arrow keys ◀ ▶ to toggle through the list or tap the triangles on the screen. |

**ENTER** or tap on the field to access the choicelist. Opening a choicelist reveals either a simple listbox or a comprehensive listbox dialogue.

### Simple listbox

| Appearance | Description | Selection |
|---|---|---|
| | • Choicelist shows items to select.<br>• A search field is shown if necessary<br>• A scroll bar is shown if necessary. | • Highlight an item and **ENTER**.<br>• To exit without changes **ESC** or tap outside the simple listbox. |

**Listbox dialogue**

| Appearance | Description | Selection |
|---|---|---|
|  | • Choicelist fills the whole screen.<br>• A search field is shown.<br>• A scroll bar is shown if necessary.<br>• The functionality comprises adding, editing and deleting of items.<br>• Listbox dialogues are explained in detail at appropriate places in the manuals. | • Highlight an item and **CONT (F1)** or **ENTER**.<br>• To exit without changes press **ESC** or tap ☒. |

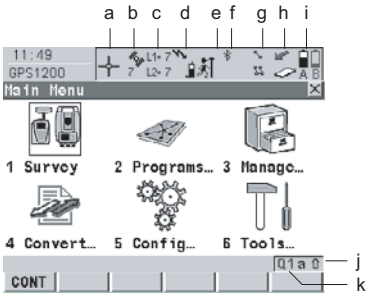
## 3.2 Icons

**Description**

Icons show the current status information of the receiver.

The icons provide information related to basic receiver functions. The icons that appear depend upon which GPS1200 receiver is used and the current receiver configuration.

**Position of the icons on the screen**




GPS12_130

a) Position status
b) Number of visible satellites
c) Contributing satellites
d) Real-time device and real-time status, Internet online status
e) Position mode
f) Bluetooth
g) Line/area
h) CompactFlash card/internal memory
i) Battery
j) **SHIFT**
k) Quick coding

**Icons**

| Icon | Description |
|---|---|
| **Position status** | Displays the status of the current position. As soon as this icon becomes visible the receiver is in a stage where practical operation can commence. |
| **Number of visible satellites** | Displays the number of theoretically visible satellites above the configured cut off angle according to the current almanac. |
| **Contributing satellites** | Displays the number of satellites that are contributing to the currently computed position solution.<br>☞ The number of contributing satellites can differ from the number of visible satellites. This may be either because satellites cannot be viewed or the observations to these satellites are considered to be too noisy to be used in the position solution. |
| **Real-time device and real-time status** | Displays the real-time device configured to be used and its status. |
| **Internet online status** | Receiver is online in the Internet. |
| **Position mode** | Displays the current position mode depending on the configuration defined. |

| Icon | Description |
|---|---|
| | Symbols are added to the basic position mode icon when raw data logging or logging of auto points is configured. |
| **Bluetooth** | The status of each Bluetooth port and any Bluetooth connection is displayed. |
| **Line/area** | The number of lines and areas currently open in the active job is displayed. |
| **CompactFlash card/internal memory** | The status of the CompactFlash card and internal memory are displayed.<br>• For the CompactFlash card, the capacity of used space is shown in seven levels.<br>• For the internal memory, the capacity of used memory is shown in nine levels. |
| **Battery** | The status and source of the battery is displayed. The remaining power in the battery is indicated by six levels.<br>For GPS1200 receivers:<br>• If two internal batteries are inserted, the battery with the lower voltage is used. |

| Icon | Description |
|---|---|
| | • If an external power supply is connected and one or two internal batteries are inserted, then the external power is used.<br>• If two external power supplies are attached, then the system uses the one which is configured as the preferred power supply.<br>For RX1250:<br>• If an external power supply is connected and one internal battery is inserted, then the external power is used. |
| **SHIFT** | The status of the **SHIFT** key is displayed. |
| **Quick coding** | Shows the quick coding configuration. Can be used with touch screen to turn quick coding on and off. |

# 4 Operation

## 4.1 Equipment Setup

The example given is for static operations.

**Equipment setup step-by-step**

| Step | Description |
|---|---|
| 1. | Set up the tripod. |
| 2. | Mount and level the tribrach on the tripod. |
| 3. | Ensure that the tribrach is over the marker. |
| 4. | Place and lock the carrier in the tribrach. |
| 5. | Screw the antenna onto the carrier. |
| 6. | Check that the tribrach is still level. |
| 7. | Insert the batteries into the receiver. |
| | Alternatively or in addition, to power the receiver externally, connect a GEB171 battery to the port PWR on the receiver. |
| 8. | If no internal memory is fitted, insert a CompactFlash card into the receiver. |

| Step | Description |
|---|---|
| ☞ | A memory device must be available otherwise a survey cannot be carried out. |
| ☞ | Close the lid carefully after insertion of the CompactFlash card in order to prevent water and dust from getting inside the receiver. |
| 9. | Attach the RX1200 to the receiver, if required, either directly or via a connection cable by plugging it into the port RX on the receiver. |
| 10. | Connect the receiver to the antenna using the antenna cable and port ANT on the receiver. |
| 11. | To hang the receiver on the tripod leg, use the hook on the rear of the unit. |
| ☞ | Alternatively place the receiver in the transport container. |
| 12. | Insert the height hook into the carrier. |
| 13. | Measure the antenna height using the height hook. |
| 14. | Press the ON/OFF button on the receiver for at least 2 s or **PROG** on the RX1200 to switch the receiver on. |
| 15. | The receiver is now ready for operation. |

## 4.2 Battery

**Primary use/charging**

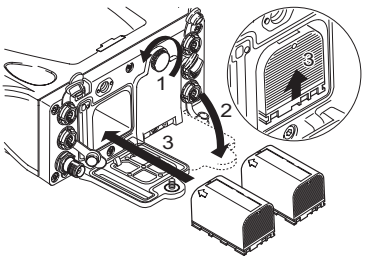
- The battery must be charged prior to using it for the first time because it is delivered with an energy content as low as possible.
- For new batteries or batteries that have been stored for a long time (> three months), it is effectual to make only one charge/discharge cycle.
- For Li-Ion batteries, a single discharging and charging cycle is sufficient. We recommend carrying out the process when the battery capacity indicated on the charger or on a Leica Geosystems product deviates significantly from the actual battery capacity available.
- The permissible temperature range for charging is between 0°C to +40°C/ +32°F to +104°F. For optimal charging we recommend charging the batteries at a low ambient temperature of +10°C to +20°C/+50°F to +68°F if possible.
- It is normal for the battery to become warm during charging. Using the chargers recommended by Leica Geosystems, it is not possible to charge the battery if the temperature is too high.

**Operation/Discharging**

- The batteries can be operated from -20°C to +55°C/-4°F to +131°F.
- Low operating temperatures reduce the capacity that can be drawn; very high operating temperatures reduce the service life of the battery.

**Change battery step-by-step**

The batteries are inserted in the front of the receiver.




GPS12_085

| Step | Description |
|---|---|
| 1. | Loosen the screw of one of the battery compartments. |
| 2. | Open the cover of the battery compartment. |

| Step | Description |
|---|---|
| 3. | With the Leica logo facing upwards, slide the battery into the battery compartment and push upwards so that it locks into position. |
| 4. | Close the cover of the battery compartment and tighten the screw. |
| 5. | Repeat steps 2. to 4. for the second battery compartment. |
| 6. | To remove a battery, loosen the screw to open the cover of the battery compartment. |
| 7. | Push the battery slightly in and at the same time downwards. This releases the battery from its fixed position. |
| 8. | Pull out the battery. |
| 9. | Close the cover of the battery compartment and tighten the screw. |
| 10. | Repeat steps 6. to 9. for the second battery compartment. |

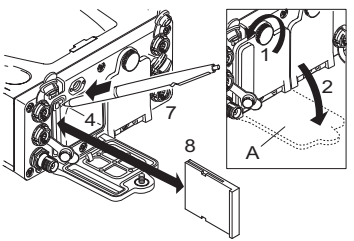
## 4.3 Working with the CompactFlash Card

- Keep the card dry.
- Use it only within the specified temperature range.
- Do not bend the card.
- Protect the card from direct impacts.

Failure to follow these instructions could result in data loss and/or permanent damage to the card.

**Insert and remove a CompactFlash card step-by-step**

The CompactFlash card is inserted into a slot inside of battery compartment A on the front of the receiver.




GPS12_086

A Battery compartment A

| Step | Description |
|---|---|
| 1. | Loosen the screw of the battery compartment A. |
| 2. | Open the cover of battery compartment A. |
| 3. | The card should be held with the lable for the care instructions towards the right-hand side of the receiver. |
| 4. | Slide the card firmly into the slot until it clicks into position. |
| 5. | Close the compartment cover. |
| 6. | To remove the card, open the cover of battery compartment A. |
| 7. | Press the eject button above the card slot. |
| 8. | Pull out the CompactFlash card. |
| 9. | Close the compartment cover. |

**Format a CompactFlash card step-by-step**

Formatting the CompactFlash card before logging data is started is required if a completely new CompactFlash card is used or if all existing data needs to be deleted.

| Step | Description |
|---|---|
| 1. | Select **Main Menu: Tools...\Format Memory Device**. |

| Step | Description |
|---|---|
| 2. | **TOOLS Format Memory Device**<br>**<Memory Device: CF Card>**<br>**<Format Method: Format Quick>**<br>Select the memory device to be formatted. |
| | By activating the format command all data will be lost. Make sure that all important data on the CompactFlash card has been backed up before formatting the card. Before formatting the internal memory make sure that all important data is first transferred to the PC. |
| | To exit the screen without formatting the memory device, press **ESC**. This returns to the previous screen. |
| 3. | **CONT (F1)** |
| 4. | **YES (F4)** to continue with the formatting of the selected device. |
| | **NO (F6)** to not continue with the formatting of the selected device and to return to **TOOLS Format Memory Device**. |
| 5. | Once the formatting of the card is completed the system returns to **GPS1200 Main Menu**. |

## 4.4 Working with the Clip-On-Housings for Devices

**Devices fitting into a clip-on-housing**

**Digital cellular phones fitting into a clip-on-housing**

| Digital cellular phone | Clip-on-housing |
|---|---|
| Siemens MC45 | GFU17 |
| Siemens MC75 | GFU24 |
| CDMA MultiTech MTMMC-C (US) | GFU19 |
| CDMA MultiTech MTMMC-C (CAN) | GFU25 |

**Radios fitting into a clip-on-housing**

| Radio | Clip-on-housing |
|---|---|
| Pacific Crest PDL, receive | GFU15 |
| Satelline 3AS, transceive | GFU14 |

**Attach a clip-on-housing step-by-step**

The clip-on-housing for devices fits on either of the small sides of the receiver.

| Step | Description |
|---|---|
| 1. | Place the clip-on-housing into position such that the guide rails for the clip-on-housing on the receiver and the guide rails on the clip-on-housing are aligned. |
| 2. | Ensure that the connector on the clip-on-housing fits to port P1 or port P3 on the receiver front panel. |
| 3. | Slide the clip-on-housing towards the receiver front panel until the connector is completely plugged into port P1 or port P3. |
| 4. | On the top side of the clip-on-housing, turn the screw clockwise, as shown by the symbols on the screw, to lock the clip-on-housing to the receiver. |

**Detach a clip-on-housing step-by-step**

| Step | Description |
|---|---|
| 1. | On the top side of the clip-on-housing, turn the screw anticlockwise, as shown by the symbols on the screw, to unlock the clip-on-housing from the receiver. |
| 2. | Slide the clip-on-housing away from the receiver front panel until the connector is completely unplugged from port P1 or port P3. |

**Insert a SIM card step-by-step**

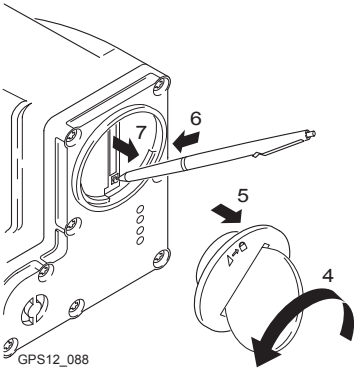
For those digital cellular phones that require SIM cards.

| Step | Description |
|---|---|
| 1. | Take the SIM card, a coin and a pen. |
| 2. | Locate the SIM card screw, that covers the SIM card slot, on the bottom of the clip-on-housing. |
| 3. | Insert the coin into the groove of the SIM card screw. |
| 4. | Turn the coin anticlockwise to loosen the SIM card screw. |
| 5. | Remove the SIM card screw from the housing. |
| 6. | Using the pen, press the small button of the SIM card slot to eject the SIM card holder. |
| 7. | Take the SIM card holder out off the housing. |
| 8. | Put the SIM card into the SIM card holder, the chip facing up. |
| 9. | Insert the SIM card holder into the SIM card slot, the chip facing the connectors inside the slot. |
| 10. | Place the SIM card screw back on the housing. |
| 11. | Insert the coin into the groove of the SIM card screw. |

| Step | Description |
| --- | --- |
| 12. | Turn the coin clockwise to tighten the SIM card screw. |

**Remove a SIM card step-by-step**

For those digital cellular phones that require SIM cards.




| Step | Description |
|---|---|
| 1. | Take a coin and a pen. |
| 2. | Locate the SIM card screw, that covers the SIM card slot, on the bottom of the clip-on-housing. |
| 3. | Insert the coin into the groove of the SIM card screw. |

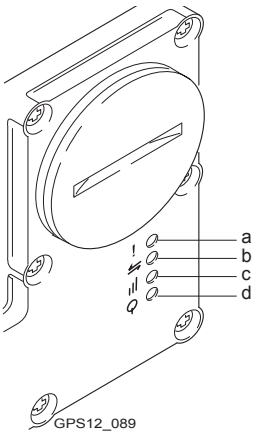
| Step | Description |
|---|---|
| 4. | Turn the coin anticlockwise to loosen the SIM card screw. |
| 5. | Remove the SIM card screw from the housing. |
| 6. | Using the pen, press the small button of the SIM card slot to eject the SIM card holder. |
| 7. | Take the SIM card holder out off the SIM card slot. |
| 8. | Take the SIM card out of the SIM card holder. |
| 9. | Put the SIM card holder back into the SIM card slot, the even side not facing the contacts inside the slot. |
| 10. | Place the SIM card screw back on the housing. |
| 11. | Turn the coin clockwise to tighten the SIM card screw. |

## LED indicators

### Description

Each clip-on-housing for a radio, digital cellular phones or bluetooth communication has **L**ight **E**mitting **D**iode indicators on the bottom side. They indicate the basic device status.

### Diagram




a) Warning LED, available for Satelline 3AS
b) Data transfer LED
c) Signal strength LED or Status LED for Bluetooth communication
d) Power LED

**Description of the LED's**

| IF the | on | is | THEN |
|---|---|---|---|
| Warning LED | GFU14 with Satelline 3AS | red | the device is in the configuration mode controlled from the PC via cable. |
| Data transfer LED | any device | off | data is not being transferred. |
| | | green or flashing green | data is being transferred. |

| IF the | on | is | THEN |
|---|---|---|---|
| Signal strength LED | GFU19 (US), GFU25 (CAN) with CDMA MultiTech MTMMC-C | red | device is on, not registered on the network. |
| | | flashing red | device is on, registered on the network. |
| | | off | download mode or device is off. |
| | GFU17 with Siemens MC45 | red | call is in progress. |
| | | red: long flash, short break | no SIM card inserted, no PIN entered or network search, user authentication or network login in progress. |
| | | red: short flash, long break | logged onto network, no call in progress. |
| | | off | device is off. |

| IF the | on | is | THEN |
|---|---|---|---|
| | GFU24 with Siemens MC75 | red | call is in progress. |
| | | red: long flash, long break | no SIM card inserted, no PIN entered or network search, user authentication or network login in progress. |
| | | red: short flash, long break | logged onto network, no call in progress. |
| | | red: flashing red, long break | GPRS PDP context activated. |
| | | red: long flash, short break | Packet switched data transfer is in progress. |
| | | off | device is off. |
| | GFU15 with Pacific Crest PDL | red or flashing red | the communication link, **D**ata **C**arrier **D**etection, is okay on the roving receiver. |
| | | off | the DCD is not okay. |

| IF the | on | is | THEN |
|---|---|---|---|
| | GFU14 with Satelline 3AS | red or flashing red | the communication link, **D**ata **C**arrier **D**etection, is okay on the roving receiver. |
| | | off | the DCD is not okay. |
| Status LED | Bluetooth communication | green | bluetooth is in stand-by mode. |
| | | orange | bluetooth is in configuration mode. |
| | | purple | bluetooth is connecting. |
| | | blue | bluetooth has connected. |
| Power LED | any device | off | power is off. |
| | | green | power is okay. |

## 4.5 Accessing Survey Application Program

**Access**

Select **Main Menu: Survey**.

OR

Press **PROG**. Highlight **Survey**. **CONT (F1)**.

**SURVEY**
**Survey Begin**

**CONT (F1)**
To accept changes and access the subsequent screen. The chosen settings become active.

**CONF (F2)**
Available for **<R-Time Mode: None>** and **<R-Time Mode: Rover>**. To configure auto points and hidden point measurements.

**CSYS (F6)**
To select a different coordinate system.

**Description of fields**

| Field | Option | Description |
|---|---|---|
| **<Job:>** | Choicelist | The active job. All jobs from **Main Menu: Manage...\Jobs** can be selected. |
| **<Coord System:>** | Output | The coordinate system currently attached to the selected **<Job:>**. |
| **<Codelist:>** | Choicelist | No codes are stored in the selected **<Job:>**. All codelists from **Main Menu: Manage...\Codelists** can be selected. |
| | Output | Codes have already been stored in the selected **<Job:>**. If codes had been copied from a System RAM codelist, then the name of the codelist is displayed. If codes have not been copied from a System RAM codelist but typed in manually, then the name of the active job is displayed. |
| **<Config Set:>** | Choicelist | The active configuration set. All configuration sets from **Main Menu: Manage...\Configuration Sets** can be selected. |

| Field | Option | Description |
|---|---|---|
| | | The receiver has numerous user configurable parameters and functions. This allows a variety of preferences to be addressed. The configuration of the parameters and functions for an individual measuring technique are combined in a configuration set. |
| **<Antenna:>** | Choicelist | The antenna currently defined to be used in the selected configuration set. All antennas from **Main Menu: Manage...\Antennas** can be selected. |

**Next step**

**CONT (F1)** accepts the changes and accesses, depending on the selected **<Config Set:>**, **SURVEY Survey: Job Name** or **SURVEY Survey Set Up Reference Station**. Measurements can be performed with **OCUPY (F1)**, **STOP (F1)** and **STORE (F1)**.

## 4.6 Guidelines for Correct Results

| | |
|---|---|
| **Undisturbed satellite signal reception** | Successful GNSS surveys require undisturbed satellite signal reception, especially at the receiver which serves as a reference. Set up the receivers in locations which are free of obstructions such as trees, buildings or mountains. |
| **Steady antenna for static surveys** | For static surveys, the antenna must be kept perfectly steady throughout the whole occupation of a point. Put the antenna on a tripod or pillar. |
| **Centred and levelled antenna** | Centre and level the antenna precisely over the marker. |

## 4.7 Operation with a Typical Configuration Set

☞ The example given is for static operations.

**Static operations step-by-step**

| Step | Description |
|---|---|
| 1. | Set up the equipment. |
| ☞ | Always fill out a field record sheet for each point. |
| ☞ | It is vital that the antenna height is measured correctly. Measure the height at the beginning and at the end of the occupation. |
| ☞ | The **Satellite Settings** of the GX1230 GG accomodates two additional fields: **<Sat System:>** (selection **<GPS Only>** or **<GPS & GLONASS>**) and **<L2C Tracking:>** (selection **<Automatic>** or **<Always Track>**). |
| 2. | Start the Survey application program. |
| 3. | **SURVEY Survey Begin**<br>**<Job: Default>**<br>**<Coord System: WGS 1984>**<br>**<Codelist: <None>>**<br>**<Config Set:>** Select a configuration set for static operations. |

| Step | Description |
|---|---|
| | **<Antenna: AX1202 GG>** |
| 4. | **CONT (F1)** |
| 5. | **SURVEY Survey: Job Name**<br>Type in the point ID and the antenna height. |
| | The position mode icon is the moving icon. This indicates that the antenna can be moved around and that no static observations are being recorded. |
| 6. | **OCUPY (F1)** starts logging of static observations. |
| | The position mode icon changes to the static icon indicating that the receiver should remain stationary. For a static survey, the GPS antenna has to be kept totally still. |
| 7. | If required, check information, for example on the satellites, the memory or the battery. |
| | **SHIFT QUIT (F6)** always terminates the survey operation, even during a site occupation. In this case all data collected since pressing **OCUPY (F1)** is lost. |
| 8. | **STOP (F1)** when enough data is collected. |
| 9. | **STORE (F1)** to store the point information. |

| Step | Description |
|---|---|
| 10. | Check that the tribrach is still level and note it down in the field record sheet. |
| 11. | Measure the antenna height and note it down in the field record sheet. |
| | If the tribrach is not level or the antenna height has changed, the collected data is not reliable. |
| 12. | **SHIFT QUIT (F6)** to return to from where **SURVEY Survey: Job Name** was accessed. |
| 13. | **ESC** until in **GPS1200 Main Menu**. |
| 14. | **GPS1200 Main Menu** |
| | **PROG** plus **USER** to turn off the receiver. |
| 15. | Take down the equipment and put it back into the transport container. |
| 16. | Are more points to be surveyed?<br>• If **yes**, continue with step 17.<br>• If **no**, continue with step 19. |
| 17. | Move to the next point. |
| 18. | Repeat steps 1. to 16. |

| Step | Description |
|---|---|
| 19. | Post-process the data in the office. |

The antenna must not be moved while data is logged, otherwise the quality of post-processed coordinates is impaired.

The CompactFlash card must be removed in **GPS1200 Main Menu**. If the card is removed when in any other screen all stored data might get corrupted, preventing LGO from successfully reading the data on the card.

# 5 Reference Station

## 5.1 Overview

**Description**

The GRX1200 Series

- are designed to operate for specific reference station applications using remote control software, for example LEICA GPS Spider reference station software.
- support internal logging of raw observations which can be downloaded using an external remote control software package such as LEICA GPS Spider.
- support streaming output of GPS and GLONASS raw observations and status information.
- can log or stream out data from specific external devices approved by Leica Geosystems, such as meteo and tilt, which can be directly output to an external remote control software package.
- can be used - with a suitable radio, digital cellular phone or modem attached - to transmit data for real-time operations using proprietary as well as standard RTCM, CMR and CMR+ formats. The GRX1200 Series cannot receive reference station broadcasts and therefore cannot be used as a real-time rover receiver.
- can be configured via a web interface.

- can send out Event E-mails and push Raw data to an FTP server.
- can log data to MDB, RINEX and compact RINEX files.
- operate in the same manner as the other GPS1200 receivers.
- have the same receiver and measurement performance as the other GPS1200 receivers. Refer to "8 Technical Data" for information on technical data.

---

**Special features**

To operate for specific reference station applications, the GRX1200 Series is, compared with the other GPS1200 receivers, equipped with some special features.

Specific to the GRX1200 Series:

- Controllable dual external power supply
- Support of external devices such as meteo and tilt

Additional features for GRX1200 Classic and GRX1200 Pro:

- Ring buffer logging
- Web interface
- Event E-mail
- FTP push
- RINEX logging

Additional features for GRX1200 Pro:

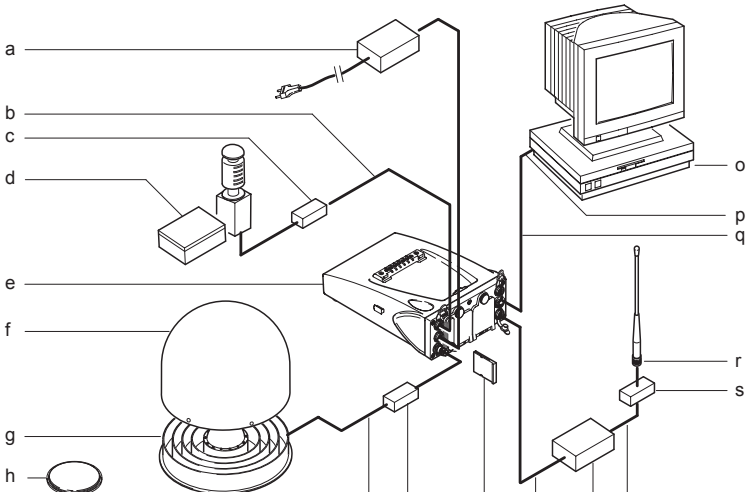
- One Ethernet port including three logical NET ports

| | | |
|---|---|---|
| | | • One port to output PPS<br>• One port to input event messages<br>• One port for input from an external oscillator |
| | Additional features for GRX1200 GG Pro: | • Tracking of GLONASS observables |
| **Data storage** | All CompactFlash cards recommended by Leica Geosystems are supported. Storing data on a CompactFlash card enables subsequent data download and post-processing. Refer to "2.2.2 Data Storage and Data Conversion Concept" for information on available memory. Refer to "4.3 Working with the CompactFlash Card" for information on inserting and removing a CompactFlash card. | |
| **Data streaming** | The receiver can be set to stream the raw observations out of one or more communication ports instead of or in addition to storing data on the CompactFlash card. | |
| **Power supply** | Refer to "2.2.3 Power Concept". | |
| **Commands for remote control** | Special commands from **O**utside **W**orld **I**nterface or Leica Binary 2 format can be used to control the receiver through the configured port. Documentation for OWI and LB2 is available on request from the Leica Geosystems representative. | |

## 5.2 Equipment Setup

**Equipment setup**

An example for an equipment setup for a reference station is shown in the following diagram. It is a basic serial setup with LEICA GPS Spider, including a meteo/tilt device and a local radio to broadcast real-time data.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GPS12_027

a) Power supply unit 100/240 V AC to 12 V DC
b) Interface cable
c) DB9 surge arrester with 12 V DC pass through
d) Meteo/tilt device with interface cable
e) Receiver GRX1200 Series
f) Weather protection radome for AT504
g) AT504
h) AX1202/AX1202 GG
i) TNC to TNC antenna cable
j) Surge arrester
k) CompactFlash card
l) Radio interface cable
m) Radio
n) Cable to connect radio antenna
o) PC for running LEICA GPS Spider software or the web interface
p) Serial port
q) Data transfer cable for receiver communication
r) Radio antenna
s) Radio surge arrester

Normally, the data transfer cable GX RX to RS232 is used to connect the GRX1200 Series to a PC. Connect the cable to port P1, P2 or P3 on the receiver and to the COM port on the PC.

Connect the device to transmit real-time data to port P1, P2 or P3 of the receiver. Some devices fit into a clip-on-housing that plugs directly into these ports. Other devices require an interface cable.

Unauthorised radio units should not be connected to the GRX1200 Series.

**Cable connection**

Cable connections are identical to other GPS1200 receivers. Additional cables are available from Leica Geosystems for the specific oscillator and Ethernet ports on the GRX1200 Pro.

**Switch on**

Hold down the ON/OFF button on the receiver for at least 2 s.

OR

Press **PROG** on the RX1200, if used.

OR

Send a pulse/data to one of the serial ports. Port P1, P2 and P3 can be configured not to allow receiver switch on upon pulse reception.

**Switch off**

Press the ON/OFF button on the receiver for at least 4 s.

OR

Press **PROG** and **USER** simultaneously on the RX1200, if used.

OR

Click on POWER DOWN in the Web Interface Tools menu.

**Behaviour when turning off and on**

Turning the GRX1200 Series off and on again resets the receiver. The consequences are:

- If the configuration of the output is stored in the configuration set, standard NMEA messages are still output.
- All data/message outputs scheduled via OWI or LB 2 commands are no longer output.
- Data logging parameters and interface configuration options, that have been set by OWI or LB 2 commands and have not been saved to a configuration set using the corresponding OWI or LB 2 command, are reset.

**Behaviour after power failure**

After temporary power failure, the GRX1200 Series will automatically power itself up and resume the previously set operations including OWI or LB2 outout. Two power fail recovery options are available - **Sudden Loss Only** and **Always**. To access the configuration select either:

- RX1200: **Main Menu: Config...\General Settings...\Start Up & Power Down**.
- Computer: **Configuration - Start Up & Power Down** in the web interface.

## 5.3 Getting Started with the GRX1200 Series

Refer to the seperate "GRX1200 Series - Getting Started" manual for more detailed information.

**Ways of operating**

The GRX1200 Series can either be operated with the RX1200 like the other GPS1200 receivers or by remote control, with its web interface or a reference station software.

| Operation | Description |
|---|---|
| With RX1200 | The receiver can be fully configured. In order to start and stop a point occupation, an external application software such as LEICA GPS Spider must send appropriate OWI or LB2 commands through a remote interface port to the receiver.<br>Available with full functionality<br>• Job management<br>• Data management<br>• Configuration of ports<br>• Configuration of operation parameters<br>• Status information |

| Operation | Description |
|---|---|
| | • Transfer capabilities including the upload of new firmware<br> With the purchased campaign option, starting and stopping point occupation for rwa data logging can be done from the RX1200.<br>Unavailable<br>Any other application program available on GPS1200 such as Stakeout<br> Refer to the relevant chapters in this manual or to the GPS1200 Technical Reference Manual for information on configuring and using the receiver. |
| By remote control | • Special commands from OWI or LB2 can be used to control the GRX1200 Series through a remote interface.<br>• For the majority of applications, the GRX1200 Series has to be operated using a suitable application software that supports the OWI or LB 2 commands, such as LEICA GPS Spider. |

| Operation | Description |
|---|---|
| | • For the GRX1200 Classic/GRX1200 Pro/GRX1200 GG Pro, remote control also supports the download of internally logged data and upload of files to the receiver. |
| By web interface | • For the GRX1200 Series a web server is included in the receiver that allows remote control from any computer via TCP/IP connection and web browser. |

**Configure a remote interface connection**

| Remote interface to be configured | Configure using |
|---|---|
| Standard default RS232 | • Each port is by default a remote port.<br>No specific receiver configurations must be done.<br>• The default settings allow immediate communication using the following port communication parameters:<br>Baud rate: 115200<br>Data bits: 8<br>Parity: None<br>Stop bit: 1<br>Flow control: None |
| Specific devices such as modems for a particular port | Must be configured using the RX1200. Refer to "Configure a modem interface step-by-step" for an example. |
| GRX1200 Pro built-in ethernet device for communicating with the receiver | Must be configured using the RX1200 or the Startup Configurator. Refer to "Configure a NET port step-by-step" for an example. |

| Remote interface to be configured | Configure using |
|---|---|
| Any other interface and operation configuration required | Can be done using LEICA GPS Spider. |

**Configure a modem interface step-by-step**

In order to use a modem for the remote interface connection, the corresponding device has to be created on the receiver and attached to the receiver serial port. As an example, the following step-by-step description shows how to configure a U.S. Robotics 56k modem for port P1 on the receiver. Refer to the GPS1200 Technical Reference Manual for more information. Refer to the manual of the modem for information on the modem configuration.

| Step | Description |
|---|---|
| 1. | **Main Menu: Config...\Interfaces...** |
| 2. | **CONFIGURE Interfaces**<br>Highlight **Remote**. |
| 3. | **EDIT (F3)** to access **CONFIGURE Interfaces**. |
| 4. | Highlight **1**. |
| ☞ | **Remote** must be displayed in column **Interface**. **USE (F6)** to display Remote. |

| Step | Description |
|---|---|
| 5. | **DEVCE (F5)** to access **CONFIGURE Devices**. |
| 6. | **PAGE (F6)** changes to the **Modem/GSM** page. |
| 7. | **CONFIGURE Devices**, **Modem/GSM** page<br>Highlight **Modem**. |
| 8. | **NEW (F2)** to create a new modem. |
| 9. | **CONFIGURE Device**<br>Type in a name and the port parameters for the modem. |
| | **ATCMD (F4)** to configure the communication commands for the modem. |
| 10. | **STORE (F1)** to return to **CONFIGURE Devices**, **Modem/GSM** page. |
| | The receiver is ready to accept an incoming call from a remote application. |
| 11. | Connect the modem to port P1 of the receiver using a modem cable. |
| 12. | Connect the modem cable to the phone line and to a suitable power supply. |

**Configure a NET port step-by-step**

In order to use a NET port for the remote interface connection, the RJ45 connector of the GRX1200 Pro/GRX1200 GG Pro must be connected to a network hub or router. If connecting directly to a PC, a crossed Ethernet cable is required. A static IP address must be available. Talk to the network administrator in order to obtain a static network IP address. The following step-by-step description shows how to create a NET port and assign the remote interface to it. Refer to the GPS1200 Technical Reference Manual and to the "GRX1200 Series - Getting Started" for more information.

| Step | Description |
|---|---|
| 1. | **Main Menu: Config...\Instrument Settings...\Set NET Parameters** |
| 2. | **CONFIGURE Set NET Parameters**<br>Enter the **I**nternet **P**rotocol address, the network mask and the gateway. |
| 3. | **CONT (F1)** returns to **GPS1200 Main Menu**. |
| 4. | **Main Menu: Config...\Interfaces...** |
| 5. | **CONFIGURE Interfaces**<br>Highlight **Remote**. |
| 6. | **EDIT (F3)** to access **CONFIGURE Interfaces**. |
| 7. | Highlight a NET port. |

| Step | Description |
|---|---|
| 8. | **CTRL (F4)** to access **CONFIGURE Set NET Port**. |
| 9. | **CONFIGURE Set NET Port**<br>**<User: Server>**<br>Configure the NET port numbers and access control. |
| 10. | **CONT (F1)** to return to **CONFIGURE Remote Interfaces**. |
| 11. | Is **Remote** displayed in the column **Interface** for the selected NET port?<br>• If **yes**, continue with step 13.<br>• If **no**, continue with step 12. |
| 12. | **USE (F6)** to use the port NET by remote. |
| 13. | Press **CONT (F1)** twice to return to GPS1200 Main Menu. |
| | The receiver is ready to accept an incoming call from a remote application. |
| 14. | Connect the receiver port NET to a LAN using a suitable network cable. |

# 6 Care and Transport

## 6.1 Transport

**Transport in the field**

When transporting the equipment in the field, always make sure that you
- either carry the product in its original transport container,
- or carry the tripod with its legs splayed across your shoulder, keeping the attached product upright.

**Transport in a road vehicle**

Never carry the product loose in a road vehicle, as it can be affected by shock and vibration. Always carry the product in its transport container and secure it.

**Shipping**

When transporting the product by rail, air or sea, always use the complete original Leica Geosystems packaging, transport container and cardboard box, or its equivalent, to protect against shock and vibration.

**Shipping, transport of batteries**

When transporting or shipping batteries, the person in charge of the product must ensure that the applicable national and international rules and regulations are observed. Before transportation or shipping, contact your local passenger or freight transport company.

## 6.2 Storage

| | |
|---|---|
| **Product** | Respect the temperature limits when storing the equipment, particularly in summer if the equipment is inside a vehicle. Refer to "8 Technical Data" for information about temperature limits. |
| **Li-Ion batteries** | • Refer to "8.1.3 Technical Data" for information about storage temperature range.<br>• A storage temperature range of -20 to +30°C/-4 to 68°F in a dry environment is recommended to minimise self-discharging of the battery.<br>• At the recommended storage temperature range, batteries containing a 10% to 50% charge can be stored for up to one year. After this storage period the batteries must be recharged.<br>• Remove batteries from the product and the charger before storing.<br>• After storage recharge batteries before using.<br>• Protect batteries from damp and wetness. Wet or damp batteries must be dried before storing or use. |

## 6.3 Cleaning and Drying

| | |
|---|---|
| **Product** | Use only a clean, soft, lint-free cloth for cleaning. If necessary, moisten the cloth with water or pure alcohol.<br>Do not use other liquids; these may attack the polymer components. |
| **Damp products** | Dry the product, the transport container, the foam inserts and the accessories at a temperature not greater than 40°C/108°F and clean them. Do not repack until everything is completely dry. |
| **Cables and plugs** | Keep plugs clean and dry. Blow away any dirt lodged in the plugs of the connecting cables. |
| **Connectors with dust caps** | Wet connectors must be completely dry before attaching the dust cap. |

# 7 Safety Directions

## 7.1 General Introduction

**Description**

The following directions should enable the person responsible for the product, and the person who actually uses the equipment, to anticipate and avoid operational hazards.

The person responsible for the product must ensure that all users understand these directions and adhere to them.

## 7.2 Intended Use

**Permitted use**

- Measuring raw data and computing coordinates using carrier phase and code signal from GNSS (Global Navigation Satellite System) satellites.
- Carrying out measurement tasks using various GNSS measuring techniques.
- Recording GNSS and point related data.
- Computation and evaluation by means of software.
- Data transfer via radio or digital cellular phone for real-time kinematic surveys.

**Adverse use**

- Use of the product without instruction.
- Use outside of the intended limits.
- Disabling safety systems.
- Removal of hazard notices.
- Opening the product using tools, for example screwdriver, unless this is specifically permitted for certain functions.
- Modification or conversion of the product.
- Use after misappropriation.
- Use of products with obviously recognizable damages or defects.
- Use with accessories from other manufacturers without the prior explicit approval of Leica Geosystems.

- Inadequate safeguards at the surveying site, for example when measuring on roads.
- Controlling of machines, moving objects or similar monitoring application without additional control- and safety installations.

**Warning**

Adverse use can lead to injury, malfunction and damage.
It is the task of the person responsible for the equipment to inform the user about hazards and how to counteract them. The product is not to be operated until the user has been instructed on how to work with it.

## 7.3 Limits of Use

**Environment**

Suitable for use in an atmosphere appropriate for permanent human habitation: not suitable for use in aggressive or explosive environments.

**Danger**

Local safety authorities and safety experts must be contacted before working in hazardous areas, or in close proximity to electrical installations or similar situations by the person in charge of the product.

## 7.4 Responsibilities

**Manufacturer of the product**

Leica Geosystems AG, CH-9435 Heerbrugg, hereinafter referred to as Leica Geosystems, is responsible for supplying the product, including the user manual and original accessories, in a completely safe condition.

**Manufacturers of non Leica Geosystems accessories**

The manufacturers of non Leica Geosystems accessories for the product are responsible for developing, implementing and communicating safety concepts for their products, and are also responsible for the effectiveness of those safety concepts in combination with the Leica Geosystems product.

**Person in charge of the product**

The person in charge of the product has the following duties:

- To understand the safety instructions on the product and the instructions in the user manual.
- To be familiar with local regulations relating to safety and accident prevention.
- To inform Leica Geosystems immediately if the product and the application becomes unsafe.

**⚠ Warning**

The person responsible for the product must ensure that it is used in accordance with the instructions. This person is also accountable for the training and the deployment of personnel who use the product and for the safety of the equipment in use.

## 7.5 International Warranty, Software Licence Agreement

**International Warranty**

The International Warranty can be downloaded from the Leica Geosystems home page at http://www.leica-geosystems.com/internationalwarranty or received from your Leica Geosystems dealer.

**Software Licence Agreement**

This product contains software that is preinstalled on the product, or that is supplied to you on a data carrier medium, or that can be downloaded by you online pursuant to prior authorization from Leica Geosystems. Such software is protected by copyright and other laws and its use is defined and regulated by the Leica Geosystems Software Licence Agreement, which covers aspects such as, but not limited to, Scope of the Licence, Warranty, Intellectual Property Rights, Limitation of Liability, Exclusion of other Assurances, Governing Law and Place of Jurisdiction. Please make sure, that at any time you fully comply with the terms and conditions of the Leica Geosystems Software Licence Agreement.

Such agreement is provided together with all products and can also be found at the Leica Geosystems home page at http://www.leica-geosystems.com/swlicense or your Leica Geosystems dealer.

You must not install or use the software unless you have read and accepted the terms and conditions of the Leica Geosystems Software Licence Agreement. Instal-

lation or use of the software or any part thereof, is deemed to be an acceptance of all the terms and conditions of such licence agreement. If you do not agree to all or some of the terms of such licence agreement, you may not download, install or use the software and you must return the unused software together with its accompanying documentation and the purchase receipt to the dealer from whom you purchased the product within ten (10) days of purchase to obtain a full refund of the purchase price.

## 7.6 Hazards of Use

**Warning**

The absence of instruction, or the inadequate imparting of instruction, can lead to incorrect or adverse use, and can give rise to accidents with far-reaching human, material, financial and environmental consequences.

**Precautions:**

All users must follow the safety directions given by the manufacturer and the directions of the person responsible for the product.

**Caution**

Watch out for erroneous measurement results if the product has been dropped or has been misused, modified, stored for long periods or transported.

**Precautions:**

Periodically carry out test measurements and perform the field adjustments indicated in the user manual, particularly after the product has been subjected to abnormal use and before and after important measurements.

**Danger**

Because of the risk of electrocution, it is very dangerous to use poles and extensions in the vicinity of electrical installations such as power cables or electrical railways.

**Precautions:**

Keep at a safe distance from electrical installations. If it is essential to work in this environment, first contact the safety authorities responsible for the electrical installations and follow their instructions.

---

**Warning**

By surveying during a thunderstorm you are at risk from lightning.

**Precautions:**

Do not carry out field surveys during thunderstorms.

---

**Warning**

During dynamic applications, for example stakeout procedures there is a danger of accidents occurring if the user does not pay attention to the environmental conditions around, for example obstacles, excavations or traffic.

**Precautions:**

The person responsible for the product must make all users fully aware of the existing dangers.

---

**Warning**

Inadequate securing of the surveying site can lead to dangerous situations, for example in traffic, on building sites, and at industrial installations.

**Precautions:**

Always ensure that the survey site is adequately secured. Adhere to the regulations governing safety and accident prevention and road traffic.

---

**Warning**

Only Leica Geosystems authorised service workshops are entitled to repair these products.

---

**Warning**

If computers intended for use indoors are used in the field there is a danger of electric shock.

**Precautions:**

Adhere to the instructions given by the computer manufacturer with regard to field use in conjunction with Leica Geosystems products.

---

**Caution**

If the accessories used with the product are not properly secured and the product is subjected to mechanical shock, for example blows or falling, the product may be damaged or people may sustain injury.

**Precautions:**

When setting-up the product, make sure that the accessories, for example tripod, tribrach, connecting cables, are correctly adapted, fitted, secured, and locked in position.

Avoid subjecting the product to mechanical stress.

**Caution**

The product uses the GPS P-Code signal which by U.S. policy may be switched off without notice.

**Caution**

During the transport, shipping or disposal of batteries it is possible for inappropriate mechanical influences to constitute a fire hazard.

**Precautions:**

Before shipping the product or disposing of it, discharge the batteries by running the product until they are flat.

When transporting or shipping batteries, the person in charge of the product must ensure that the applicable national and international rules and regulations are observed. Before transportation or shipping contact your local passenger or freight transport company.

**Warning**

Using a battery charger not recommended by Leica Geosystems can destroy the batteries. This can cause fire or explosions.

**Precautions:**

Only use chargers recommended by Leica Geosystems to charge the batteries.

**⚠ Warning**

High mechanical stress, high ambient temperatures or immersion into fluids can cause leackage, fire or explosions of the batteries.

**Precautions:**

Protect the batteries from mechanical influences and high ambient temperatures. Do not drop or immerse batteries into fluids.

---

**⚠ Warning**

Short circuited battery terminals can overheat and cause injury or fire, for example by storing or transporting in pockets if battery terminals come in contact with jewellery, keys, metallized paper or other metals.

**Precautions:**

Make sure that the battery terminals do not come into contact with metallic objects.

---

**⚠ Warning**

If an external antenna is not properly fitted to vehicles or any other means of transportation it can be torn off by mechanical shock, vibration or wind, possibly causing accident and injury.

**Precautions:**

Attach the external antenna professionally. The external antenna must be secured additionally, for example by use of a safety cord. Ensure that the mounting device is correctly mounted and able to safely carry the weight of the external antenna (>1 kg).

---

**Warning**

If the product is improperly disposed of, the following can happen:

- If polymer parts are burnt, poisonous gases are produced which may impair health.
- If batteries are damaged or are heated strongly, they can explode and cause poisoning, burning, corrosion or environmental contamination.
- By disposing of the product irresponsibly you may enable unauthorized persons to use it in contravention of the regulations, exposing themselves and third parties to the risk of severe injury and rendering the environment liable to contamination.

**Precautions:**

The product must not be disposed with household waste.
Dispose of the product appropriately in accordance with the national regulations in force in your country.
Always prevent access to the product by unauthorized personnel.

Product specific treatment and waste management information can be downloaded from the Leica Geosystems home page at http://www.leica-geosystems.com/treatment or received from your Leica Geosystems dealer.

---

**Danger**

If the product is used in exposed locations, for example on masts, mountains or buildings, it is at risk from lightning. Danger from high voltages also exists near

power lines. Lightning, voltage peaks, or the touching of power lines can cause damage, injury and death.

**Precautions:**

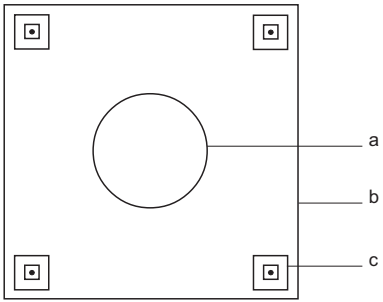
- Do not use the product in a thunderstorm as you may increase the risk of being struck by lightning.
- Be sure to remain at a safe distance from electrical installations. Do not use the product directly under or in close proximity to power lines. If it is essential to work in such an environment contact the safety authorities responsible for electrical installations and follow their instructions.
- If the product has to be permanently mounted in an exposed location, it is advisable to provide a lightning conductor system. A suggestion on how to design a lightning conductor for the product is given below. Always follow the regulations in force in your country with regard to grounding antennas and masts. These installations must be carried out by an authorised specialist.
- To prevent damages due to indirect lightning strikes (voltage spikes) cables, for example for antenna, power source or modem should be protected with appropriate protection elements, like a lightning arrester. These installations must be carried out by an authorized specialist.
- If there is a risk of a thunderstorm, or if the equipment is to remain unused and unattended for a long period, protect your product additionally by unplugging all systems components and disconnecting all connecting cables and supply cables, for example, receiver - antenna.

**Lightning conductors**

Suggestion for design of a lightning conductor for a GPS system:

1. On non-metallic structures
   Protection by air terminals is recommended. An air terminal is a pointed solid or tubular rod of conducting material with proper mounting and connection to a conductor. The position of four air terminals should be uniformly distributed around the antenna at a distance equal to the height of the air terminal.
   The air terminal diameter should be 12 mm for copper or 15 mm for aluminium. The height of the air terminals should be 25 cm to 50 cm. All air terminals should be connected to the down conductors. The diameter of the air terminal should be kept to a minimum to reduce GPS signal shading.
2. On metallic structures
   Protection is as described for non-metallic structures, but the air terminals can be connected directly to the conducting structure without the need for down conductors.

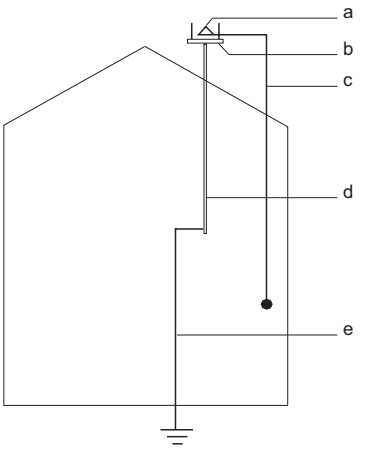
**Air terminal arrangement, plan view**




GPS12_059

a) Antenna
b) Support structure
c) Air terminal

## Grounding the receiver/antenna




GPS12_060

a) Antenna
b) Lightning conductor array
c) Antenna/receiver connection
d) Metallic mast
e) Connection to earth

## 7.7 Electromagnetic Compatibility EMC

**Description**

The term Electromagnetic Compatibility is taken to mean the capability of the product to function smoothly in an environment where electromagnetic radiation and electrostatic discharges are present, and without causing electromagnetic disturbances to other equipment.

**Warning**

Electromagnetic radiation can cause disturbances in other equipment.

Although the product meets the strict regulations and standards which are in force in this respect, Leica Geosystems cannot completely exclude the possibility that other equipment may be disturbed.

**Caution**

There is a risk that disturbances may be caused in other equipment if the product is used in conjunction with accessories from other manufacturers, for example field computers, personal computers, two-way radios, non-standard cables or external batteries.

**Precautions:**

Use only the equipment and accessories recommended by Leica Geosystems. When combined with the product, they meet the strict requirements stipulated by the guidelines and standards. When using computers and two-way radios, pay attention to the information about electromagnetic compatibility provided by the manufacturer.

**Caution**

Disturbances caused by electromagnetic radiation can result in erroneous measurements.
Although the product meets the strict regulations and standards which are in force in this respect, Leica Geosystems cannot completely exclude the possibility that the product may be disturbed by very intense electromagnetic radiation, for example, near radio transmitters, two-way radios or diesel generators.

**Precautions:**

Check the plausibility of results obtained under these conditions.

**Warning**

If the product is operated with connecting cables attached at only one of their two ends, for example external supply cables, interface cables, the permitted level of electromagnetic radiation may be exceeded and the correct functioning of other products may be impaired.

**Precautions:**

While the product is in use, connecting cables, for example product to external battery, product to computer, must be connected at both ends.

**Radios, digital cellular phones or ATX1230/ATX1230 GG with Bluetooth**

Use of product with radio, digital cellular phone devices or ATX1230/ATX1230 GG with Bluetooth:

**Warning**

Electromagnetic radiation can cause disturbances in other equipment, in installations, in medical devices, for example pacemakers or hearing aids and in aircraft. It can also affect humans and animals.

**Precautions:**

Although the product meets in combination with radio or digital cellular phone devices recommended by Leica Geosystems the strict regulations and standards which are in force in this respect, Leica Geosystems cannot completely exclude the possibility that other equipment may be disturbed or that humans or animals may be affected.

- Do not operate the product with radio or digital cellular phone devices in the vicinity of filling stations or chemical installations, or in other areas where an explosion hazard exists.
- Do not operate the product with radio or digital cellular phone devices near to medical equipment.
- Do not operate the product with radio or digital cellular phone devices in aircraft.
- Do not operate the product with radio or digital cellular phone devices for long periods immediately next to your body.

## 7.8 FCC Statement, Applicable in U.S.

**Applicability**

The grayed paragraph below is only applicable for products of the GPS1200 System without radio, digital cellular phone devices or Bluetooth.

**⚠ Warning**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules.
These limits are designed to provide reasonable protection against harmful interference in a residential installation.
This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

**Warning**

Changes or modifications not expressly approved by Leica Geosystems for compliance could void the user's authority to operate the equipment.

**Labelling GPS1200**

Type: GX... .....

. . . . . .

. . . . . .

. . . . . .

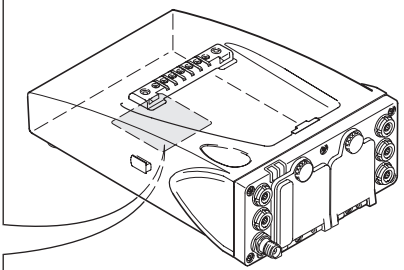
. . . . . . . . . . . . . . . . . . . . . .

*This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.*

. . . . . .

. . . . . .

. . . . . .

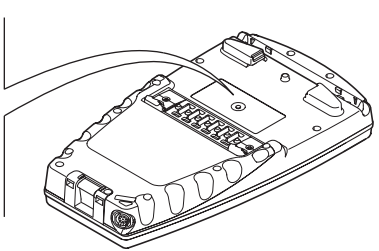


GPS12_101

## Labelling RX1210

Type: RX1210 .....

*This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including i nterference that may cause undesired operation.*

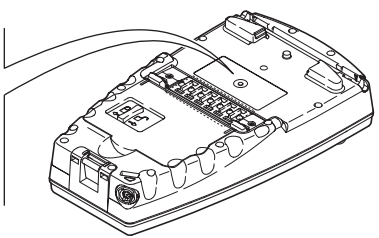


RX12_023

## Labelling RX1250 X

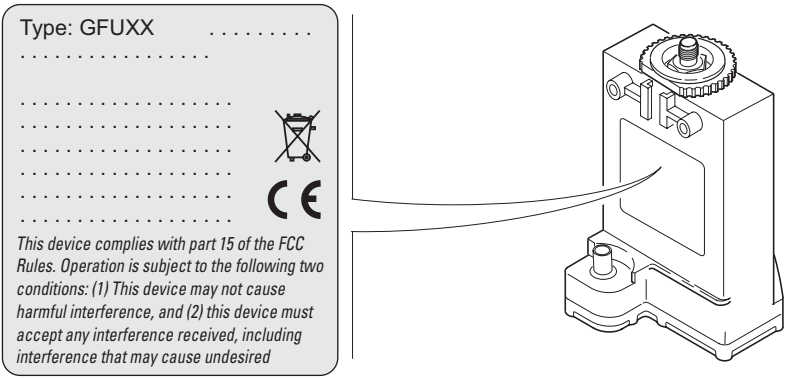
***Type:*** **RX1250**

*This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.*



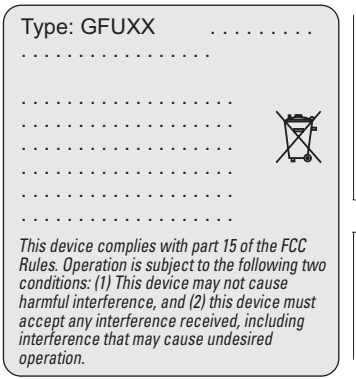
RX12_025

**Labelling GFU16, GFU17, GFU24**


Type: GFUXX . . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
CE
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired

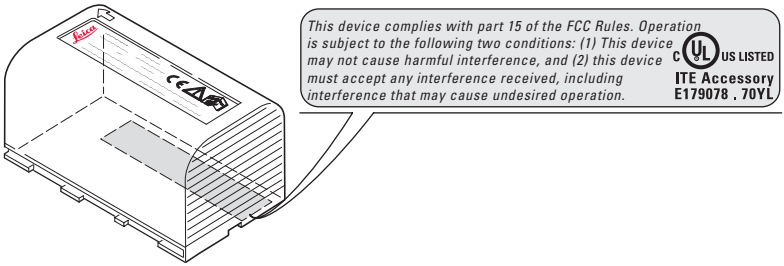
GPS12_103

## Labelling GFU19, GFU25


Type: GFUXX . . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

TPS12_218

## Labelling internal battery GEB211, GEB221


This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
C UL US LISTED
ITE Accessory
E179078 , 70YL

TPS12_082

# 8 Technical Data

## 8.1 Receiver Technical Data

### 8.1.1 Tracking Characteristics of the Receiver

| | | |
|---|---|---|
| **Receiver technology** | SmartTrack+/SmartTrack | |
| **Satellite reception** | GX1230 GG: | Dual frequency |
| | GX1230/GX1220/GRX1200 Series: | Dual frequency |
| | GX1210: | Single frequency |
| **Receiver channels** | GX1230 GG, GRX1200 GG Pro: | 14 channels continuous tracking on L1 and L2 (GPS); twelve channels continuous tracking on L1 and L2 (GLONASS); two channels tracking SBAS (only GX1230 GG). |
| | GX1230/GX1220/GRX1200 Series: | Twelve channels continuous tracking on L1 and L2 |
| | GX1210: | Twelve channels continuous tracking on L1 |

## Supported codes

### GPS

| Type | L1 | L2 |
|---|---|---|
| GX1230 GG | Carrier phase, C/A code | Carrier phase, C code (L2C) and P2 code |
| GX1230/GX1220/ GRX1200 Series | Carrier phase, C/A code | Carrier phase, P2 code |
| GX1210 | Carrier phase, C/A code | - |

### GLONASS

| Type | L1 | L2 |
|---|---|---|
| GX1230 GG | Carrier phase, C/A code | Carrier phase, P2 code |

## Carrier tracking

### GPS

| Condition | GX1230 GG/GX1230/GX1220/ GRX1200 Series | GX1210 |
|---|---|---|
| L1, AS off or on | Reconstructed carrier phase via C/A code | Reconstructed carrier phase via C/A code |

| Condition | GX1230 GG/GX1230/GX1220/ GRX1200 Series | GX1210 |
|---|---|---|
| L2, AS off | Reconstructed carrier phase via P2 code | - |
| L2, AS on | Switches automatically to patented P code-aided technique providing full L2 reconstructed carrier phase | - |

**GLONASS**

| Condition | GX1230 GG |
|---|---|
| L1 | Reconstructed carrier phase via C/A code |
| L2 | Reconstructed carrier phase via P2 code |

**Code measurements**

**GPS**

| Condition | GX1230 GG/GX1230/GX1220/ GRX1200 Series | GX1210 |
|---|---|---|
| L1, AS off<br>L1, AS on | Carrier phase smoothed code measurements: C/A code | Carrier phase smoothed C/A code measurements |
| L2, AS off | Carrier phase smoothed code measurements: P2 code | - |
| L2, AS on | Carrier phase smoothed code measurements: Patented P code-aided code | - |

**GLONASS**

| Condition | GX1230 GG |
|---|---|
| L1 | Carrier phase smoothed code measurements: C/A code |
| L2 | Carrier phase smoothed code measurements: P2 code |

Carrier phase and code measurements on L1 and L2 are fully independent with AS on or off.

| | | |
|---|---|---|
| **Satellites tracked** | GX1230 GG | Up to 14 simultaneously on L1 and L2 (GPS) + up to twelve simultaneously on L1 and L2 (GLONASS) + up to two SBAS |
| | GX1230/GX1220/GRX1200 Series: | Up to twelve simultaneously on L1 and L2 + up to two SBAS |
| | GX1210: | Up to twelve simultaneously on L1 + up to two SBAS |

## 8.1.2 Accuracy

Accuracy is dependent upon various factors including the number of satellites tracked, constellation geometry, observation time, ephemeris accuracy, ionospheric disturbance, multipath and resolved ambiguities.

The following accuracies, given as **r**oot **m**ean **s**quare, are based on measurements processed using LGO and on real-time measurements.

GPS and GLONASS can increase accuracy by up to 30% relative to GPS only.

**Differential code**

For all receivers, the baseline precision of a differential code solution for static and kinematic surveys is 25 cm.

**Differential phase in post-processing**

**Normal baselines with GX1230 GG/GX1230/GX1220/GRX1200 Series plus AX1202/AX1202 GG**

| Static | | Kinematic | |
|---|---|---|---|
| **Horizontal** | **Vertical** | **Horizontal** | **Vertical** |
| 5 mm + 0.5 ppm | 10 mm + 0.5 ppm | 10 mm + 1 ppm | 20 mm + 1 ppm |

**Long baselines with GX1230 GG/GX1230/GX1220/GRX1200 Series plus AT504**

| Static | |
|---|---|
| **Horizontal** | **Vertical** |
| 3 mm + 0.5 ppm | 6 mm + 1 ppm |

**Short baselines with GX1210 plus AX1201**

| Static | | Kinematic |
|---|---|---|
| **Horizontal** | **Vertical** | |
| 10 mm + 1 ppm | 20 mm + 2 ppm | 20 mm + 2 ppm |

**Differential phase in real-time**

**GX1230 GG/GX1230/GX1220/GRX1200 Series plus AX1202/AX1202 GG**

| Static | | Kinematic | |
|---|---|---|---|
| **Horizontal** | **Vertical** | **Horizontal** | **Vertical** |
| 5 mm + 0.5 ppm | 10 mm + 0.5 ppm | 10 mm + 1 ppm | 20 mm + 1 ppm |

## 8.1.3 Technical Data

**Dimensions**

The dimensions are given for the housing without the sockets.

| Type | Length [m] | Width [m] | Thickness [m] |
|---|---|---|---|
| All receivers | 0.212 | 0.166 | 0.079 |

**Weight**

Receiver weights without battery and radio:

| Type | Weight [kg] |
|---|---|
| GX1230 GG/GX1230/GX1220/GX1210/GRX1200 Classic | 1.2 |
| GRX1200 Pro/GRX1200 GG Pro | 1.3 |

**Recording**

Data can be recorded on the CompactFlash card or in the internal memory, if fitted.

| Type | Capacity [MB] | Data capacity |
|---|---|---|
| CompactFlash card | • 64<br>• 256<br>• 1024 | 64 MB is typically sufficient for about<br>GPS only (8 satellites)<br>• 500 h L1 + L2 data logging at 15 s rate<br>• 2000 h L1 + L2 data logging at 60 s rate<br>• 90000 real-time points with codes<br>GPS + GLONASS (8 + 4 satellites)<br>• 340 h data logging at 15 s rate<br>• 1360 h data logging at 60 s rate<br>• 90000 real-time points with codes |
| Internal memory | • 256 | |

**Power**

| | |
|---|---|
| Power consumption: | GX1230 GG/GX1230/GX1220/GX1210, radio and RX1200 excluded:<br>3.2 W typically, 270 mA |
| External supply voltage: | Nominal 12 V DC (⎓, GEV71 car battery cable to a 12 V car battery), voltage range 10.5-28 V DC |

**Battery internal**

| | |
|---|---|
| Type: | Li-Ion |
| Voltage: | 7.4 V |
| Capacity: | GEB221: 3.8 Ah |

**Battery external**

| | |
|---|---|
| Type: | NiMH |
| Voltage: | 12 V |
| Capacity: | GEB171: 8.0 Ah |

**Operating times**

The given operating times are valid for

- all receiver types except GRX1200 Pro/GRX1200 GG Pro.
- receiver plus antenna plus RX1200 without keyboard illumination and without screen heating.
- two fully charged GEB221 batteries.
- room temperature. Operating times will be shorter when working in cold weather.

| Equipment | | | Operating time |
|---|---|---|---|
| **Type** | **Radio** | **Digital cellular phone** | |
| Static | - | - | 15 h continuously |
| Rover | Pacific Crest PDL, receive | - | 10 h continuously |
| Rover | - | Siemens MC45, Siemens MC75 | 10 h continuously |

## Environmental specifications

### Temperature

| Type | Operating temperature [°C] | Storage temperature [°C] |
|---|---|---|
| All receivers | -40 to +65 | -40 to +80 |
| Leica CompactFlash cards, all sizes | -40 to +80 | -40 to +80 |
| Battery internal | -20 to +55 | -40 to +70 |

### Protection against water, dust and sand

| Type | Protection |
|---|---|
| All receivers | IP67 (IEC 60529)<br>Dusttight<br>Waterproof to 1 m temporary immersion |

**Humidity**

| Type | Protection |
|---|---|
| All receivers | Up to 100 %<br>The effects of condensation are to be effectively counteracted by periodically drying out the receiver. |

**PPS output**

For GX1200 with PPS/Event option and GRX1200 Pro/GRX1200 GG Pro

PPS output characteristics:

| | |
|---|---|
| Peak: | 3.3 V = High |
| Impedance: | 50 Ω |
| Pulse length: | 1 ms |
| Leading edge: | Coinciding with the beginning of each epoch. |
| Positive/negative edge: | Selectable via RX1200. |

Cable connectivity:

| | |
|---|---|
| Matched with an appropriate impedance of: | 50 Ω |
| Socket: | LEMO ERN.0S.250.CTL |

**Event input**

For GX1200 with PPS/Event option and GRX1200 Pro/GRX1200 GG Pro

| | |
|---|---|
| Pulse type: | TTL, positive or negative going pulse |
| Pulse length: | 125 ns at minimum |
| Voltage: | TTL level, ~ 5 V, min. 3.3 V |
| Pin definition: | Centre = signal, Case = ground |
| Socket: | LEMO HGP.00.250.CTL |

**External oscillator input**

For GRX1200 Pro/GRX1200 GG Pro

External clock input:

| | |
|---|---|
| Frequency: | 5 MHz or 10 MHz |
| Input impedance: | 50 Ω nominal |
| Input VSWR: | 2:1 maximum |
| Signal level: | 0 dBm minimum to +13.0 dBm maximum |
| Frequency stability: | ±0.5 ppm maximum |
| Wave shape: | Sinusoidal |
| Connector: | MMCX female |

## 8.2 Antennas Technical Data

**Description and use**

The antenna is selected for use based upon the application. The table gives a description and the intended use of the individual antennas.

| Type | Description | Use |
|---|---|---|
| AX1201 | L1 SmartTrack antenna with built in groundplane. | With GX1210 receiver. |
| AX1202/ AX1202 GG | L1/L2 SmartTrack/SmartTrack+ antenna with built in ground-plane. | With GX1220, GX1230, GX1230 GG receiver or GRX1200 Series. |
| AT504 | Dorne & Margolin L1/L2 antenna element with gold anodized choke ring ground-plane. Complies with IGS type 'T' antenna, JPL design. Optional protective radome. | With GX1220, GX1230, GX1230 GG or GRX1200 Series where higher precision is required. For example static surveys of long baselines, tectonic plate moni-toring and reference stations. |

**Dimensions**

| Type | AX1201 | AX1202/ AX1202 GG | AT504 |
|---|---|---|---|
| Height | 6.2 cm | 6.2 cm | 14.0 cm |
| Diameter | 17.0 cm | 17.0 cm | 38.0 cm |

**Connector**

| | |
|---|---|
| AX1201/AX1202/AX1202 GG: | TNC female |
| AT504: | N female |

**Mounting**

| | |
|---|---|
| All antennas: | 5/8" Whitworth |

**Weight**

| | |
|---|---|
| AX1201/AX1202/AX1202 GG: | 0.4 kg |
| AT504 | 4.3 kg, radome 1.1 kg |

**Electrical data**

| Type | AX1201/AX1202 | AX1202 GG | AT504 |
|---|---|---|---|
| Voltage | 4.5 to 18 V DC | 4.5 to 18 V DC | 4.75 to 15 V DC |
| Current | 50 mA max | 50 mA max | 50 mA max |
| Frequency | GPS L1 1575.42 MHz | GPS L1 1575.42 MHz | GPS L1 1575.42 MHz |

| Type | AX1201/AX1202 | AX1202 GG | AT504 |
|---|---|---|---|
| | Only AX1202:<br>GPS L2<br>1227.60 MHz | GPS L2 1227.60 MHz<br><br>GLONASS L1<br>1602.5625-1611.5 MHz<br>GLONASS L2<br>1246.4375-1254.3 MHz | GPS L2<br>1227.60 MHz |
| Gain | Typically 27 dBi | Typically 27 dBi | Typically 27 dBi |
| Noise Figure | Typically < 2 dBi | Typically < 2 dBi | 3 dBi max |
| BW, -3 dBiW | - | - | 40 MHz min |
| BW, -30 dBi | - | - | 200 MHz max |

## Environmental specifications

### Temperature

| Type | Operating temperature [°C] | Storage temperature [°C] |
|---|---|---|
| All antennas | -40 to +70 | -55 to +85 |

**Protection against water, dust and sand**

| Type | Protection |
|---|---|
| AX1201/AX1202/ AX1202 GG | IP67 (IEC 60529)<br>Dusttight<br>Protected against water jets<br>Waterproof to 1 m temporary immersion |
| AT504 | IP57 (IEC 60529)<br>Dustprotected<br>Waterproof to 1 m temporary immersion |

**Humidity**

| Type | Protection |
|---|---|
| AX1201/AX1202/ AX1202 GG | Up to 100 %<br>The effects of condensation are to be effectively counteracted by periodically drying out the antenna. |

| Type | Protection |
|---|---|
| AT504 | Up to 92 %<br>The effects of condensation are to be effectively counteracted by periodically drying out the antenna. |

**Cable length**

| Separation distance from receiver ... | to antenna | Supplied cable lengths [m] | Optional cable lengths [m] |
|---|---|---|---|
| GX1230 GG/GX1230/ GX1220/GX1210 | AX1201/AX1202/ AX1202 GG | 1.2<br>2.8 | 30<br>50<br>70 |
| GRX1200 Classic/ GRX1200 Lite | AX1202/AX1202 GG | 1.2<br>2.8<br>10 | 30<br>50<br>70 |
| GRX1200 Pro/ GRX1200 GG Pro | AT504/AX1202/ AX1202 GG | 1.2<br>2.8<br>10 | 30<br>50<br>70 |

## 8.3 RX1200 Technical Data

**Control unit**

| | |
|---|---|
| Display: | 1/4 VGA (320 x 240 pixels), monochrome, graphics capable LCD, illumination, optional touch screen |
| Keyboard: | 62 keys including 12 function keys, illumination |
| Angle Display: | 360°'", 360° decimal, 400 gon, 6400 mil, V % |
| Distance Display: | m, ft int, ft us, ft int inch, ft us inch |
| Touch screen if fitted: | Toughened film on glass |

**Dimensions**

| Type | Length [m] | Width [m] | Thickness [m] |
|---|---|---|---|
| RX1210 | 0.218 | 0.123 | 0.037 |
| RX1250 X | 0.218 | 0.123 | 0.047 |

**Weight**

| Type | Weight [kg]/[lbs] |
|---|---|
| RX1210 | 0.507/1.118 |
| RX1250 X with GEB211 | 0.741/1.634 |

## Recording

For RX1250 X, data can be recorded on the CompactFlash card.

| Type | Capacity [MB] | Data capacity |
|---|---|---|
| CompactFlash card | • 64<br>• 256<br>• 1024 | 64 MB is typically sufficient for about<br>GPS only (8 satellites)<br>• 500 h L1 + L2 data logging at 15 s rate<br>• 2000 h L1 + L2 data logging at 60 s rate<br>• 90000 real-time points with codes<br>GPS + GLONASS (8 + 4 satellites)<br>• 340 h data logging at 15 s rate<br>• 1360 h data logging at 60 s rate<br>• 90000 real-time points with codes |

## Power

| Type | Consumption [W] | External supply voltage |
|---|---|---|
| RX1210 | 1 | Nominal voltage 12 V DC (⎓)<br>Voltage range 11.5 V-28 V |

| Type | Consumption [W] | External supply voltage |
|---|---|---|
| RX1250 X | 1.1<br>Bluetooth to SmartAntenna, digital cellular phone powered from GHT56 | Nominal voltage 12 V DC (⎓)<br>Voltage range 11.5 V-28 V |

**Internal battery**

| Type | Battery | Voltage | Capacity | Operating time, typical |
|---|---|---|---|---|
| RX1250 X | Li-Ion | 7.4 V | GEB211: 1.9 Ah | 11 h<br>Bluetooth to SmartAntenna |

**Environmental specifications**

**Temperature**

| Type | Operating temperature [°C] | Storage temperature [°C] |
|---|---|---|
| RX1210/RX1250 X | -30 to +65<br>Bluetooth: -25 to +65 | -40 to +80 |

### Protection against water, dust and sand

| Type | Protection |
|---|---|
| RX1210/RX1250 X | IP67 (IEC 60529)<br>Dusttight<br>Waterproof to 1 m temporary immersion |

### Humidity

| Type | Protection |
|---|---|
| RX1210/RX1250 X | Up to 100 %<br>The effects of condensation are to be effectively counteracted by periodically drying out the RX1210. |

## Ports

| Type | 8 pin LEMO-1 | Special clip-on interface |
|---|---|---|
| RX1210 | For power and/or communication | For power and communication to GPS1200 |
| RX1250 X | For power and/or communication | For communication to GHT56 and GPS1200 |

# 8.4 Conformity to National Regulations

## 8.4.1 RX1250

**Conformity to national regulations**

- FCC Part 15 (applicable in US)
- Hereby, Leica Geosystems AG, declares that the RX1250 is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC. The declaration of conformity may be consulted at http://www.leica-geosystems.com/ce.

Class 1 equipment according European Directive 1999/5/EC (R&TTE) can be placed on the market and be put into service without restrictions in any EU Member state.

- The conformity for countries with other national regulations not covered by the FCC part 15 or European directive 1999/5/EC has to be approved prior to use and operation.

**Frequency band**

| Type | Frequency band [MHz] |
|---|---|
| RX1250, Bluetooth | 2400 - 2483.5 |

**Ouput power**

| Type | Output power [mW] |
|---|---|
| RX1250, Bluetooth | 2.5 |

**Antenna**

| Type | Antenna | Gain [dBi] | Connector | Frequency band [MHz] |
|---|---|---|---|---|
| RX1250, Bluetooth | Integrated antenna | - | - | - |

## 8.4.2 Receiver

**Conformity to national regulations**

- FCC Part 15 (applicable in US)
- Hereby, Leica Geosystems AG, declares that the Receiver is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC. The declaration of conformity may be consulted at http://www.leica-geosystems.com/ce.

  Class 1 equipment according European Directive 1999/5/EC (R&TTE) can be placed on the market and be put into service without restrictions in any EU Member state.
- The conformity for countries with other national regulations not covered by the FCC part 15 or European directive 1999/5/EC has to be approved prior to use and operation.

**Frequency band**

| Type | Frequency band [MHz] |
|---|---|
| **GX1210** | 1575.42 |
| **GX1230 GG**/GX1230/**GX1220**/ GRX1200 Series | 1227.60<br>1575.42 |
| **GX1230 GG** | 1246.4375 - 1254.3<br>1602.4375 - 1611.5 |

**Output power**

| Type | Output power [mW] |
|---|---|
| Receiver | Receive only |

**Antenna**

Type External GNSS antenna element (receive only)

## 8.4.3 GFU16, Bluetooth communication

**Conformity to national regulations**

- FCC Part 15 (applicable in US)
- Hereby, Leica Geosystems AG, declares that the GFU16 is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC. The declaration of conformity may be consulted at http://www.leica-geosystems.com/ce.

Class 2 equipment according European Directive 1999/5/EC (R&TTE) for which following EEA Member States apply restrictions on the placing on the market or on the putting into service or require authorization for use:

- France
- Italy
- Norway (if used in the geographical area within a radius of 20km from the centre of Ny-Ålesund)

- The conformity for countries with other national regulations not covered by the FCC part 15 or European directive 1999/5/EC has to be approved prior to use and operation.

**Frequency band** 2402 - 2480 MHz

**Output power** Bluetooth Class 2 type: 2.5 mW

| | | |
|---|---|---|
| **Antenna** | Type | Internal patch antenna |
| | Gain | 2.7 dBi |

## 8.4.4 GFU17, Siemens MC45

**Conformity to national regulations**

- FCC Part 15 and 24 (applicable in US)
- Hereby, Leica Geosystems AG, declares that the GFU17 is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC. The declaration of conformity may be consulted at http://www.leica-geosystems.com/ce.

Class 1 equipment according European Directive 1999/5/EC (R&TTE) can be placed on the market and be put into service without restrictions in any EU Member state.

- The conformity for countries with other national regulations not covered by the FCC part 15 and 24 or European directive 1999/5/EC has to be approved prior to use and operation.

**Frequency band**

Tri-Band EGSM900 / GSM1800 / GSM1900 MHz

**Output power**

| | |
|---|---|
| EGSM900: | 2 W |
| GSM1800: | 1 W |
| GSM1900: | 1 W |

## Antennas

| Type | GAT 3 | GAT 5 |
|---|---|---|
| Frequency band | 900 or 1800 MHz | 850 or 1900 MHz |
| Type | Detachable λ/2 antenna | Detachable λ/2 antenna |
| Gain | 0 dBi | 0 dBi |
| Connector | TNC | TNC |

## Specific Absorption Rate (SAR)

The product meets the limits for the maximum permissible exposure of the guidelines and standards which are force in this respect. The product must be used with the recommended antenna. A separation distance of at least 20 centimeters should be kept between the antenna and the body of the user or nearby person within the intended application.

## 8.4.5 GFU24, Siemens MC75

**Conformity to national regulations**

- FCC Part 15, 22 and 24 (applicable in US)
- Hereby, Leica Geosystems AG, declares that the GFU24 is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC. The declaration of conformity may be consulted at http://www.leica-geosystems.com/ce.

Class 1 equipment according European Directive 1999/5/EC (R&TTE) can be placed on the market and be put into service without restrictions in any EU Member state.

- The conformity for countries with other national regulations not covered by the FCC part 15, 22 and 24 or European directive 1999/5/EC has to be approved prior to use and operation.

**Frequency band**

Quad-Band EGSM850 / EGSM900 / GSM1800 / GSM1900 MHz

**Output power**

| | |
|---|---|
| EGSM850: | 2 W |
| EGSM900: | 2 W |
| GSM1800: | 1 W |
| GSM1900: | 1 W |

## Antennas

| Type | GAT 3 | GAT 5 |
|---|---|---|
| Frequency band | 900 or 1800 MHz | 850 or 1900 MHz |
| Type | Detachable λ/2 antenna | Detachable λ/2 antenna |
| Gain | 0 dBi | 0 dBi |
| Connector | TNC | TNC |

## Specific Absorption Rate (SAR)

The product meets the limits for the maximum permissible exposure of the guidelines and standards which are force in this respect. The product must be used with the recommended antenna. A separation distance of at least 20 centimeters should be kept between the antenna and the body of the user or nearby person within the intended application.

## 8.4.6 GFU19 (US), GFU25 (CAN) CDMA MultiTech MTMMC-C

**Conformity to national regulations**

- FCC Part 15, 22 and 24 (applicable in US)
- The conformity for countries with other national regulations not covered by the FCC part 15, 22 and 24 has to be approved prior to use and operation.

**Frequency band**

Dual-Band CDMA850/CDMA1900 MHz

**Output power**

CDMA850: 2 W
CDMA1900: 0.4 W

**Antenna**

| Type | GAT 5 |
|---|---|
| Frequency band | 850 or 1900 MHz |
| Type | Detachable λ/2 antenna |
| Gain | 0 dBi |
| Connector | TNC |

**Specific Absorption Rate (SAR)**

The product meets the limits for the maximum permissible exposure of the guidelines and standards which are force in this respect. The product must be used with the recommended antenna. A separation distance of at least 20 centimeters should be kept between the antenna and the body of the user or nearby person within the intended application.

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Leica Geosystems AG, Heerbrugg, Switzerland, has been certified as being equipped with a quality system which meets the International Standards of Quality Management and Quality Systems (ISO standard 9001) and Environmental Management Systems (ISO standard 14001).

**Ask your local Leica Geosystems dealer for more information about our TQM program.**

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